**AP Biology – Unit 1 Outline**

**I. Evolution – Organisms & Adaptations**

a. **Evolution** happens when a **population’s** **genome changes**: descent with modification

b. Natural variations among organism **phenotypes** due to differences in DNA (**Genotypes**). This genetic variation happens **randomly** (mutations) and is a key factor for natural selection to operate. Advantageous genes do NOT arise “upon request”

c. Adaptations are only defined by their **environments**

Ex. Antibiotic resistance genes in bacteria are beneficial in an environment with antibiotics but could be too costly to maintain in an environment without antibiotics.

d. Adaptations result in **differential reproductive success** – more offspring left by certain members of the population…leads to **natural selection** – survival of the fittest

e. **Artificial selection** produces traits humans desire, not adaptations

**II. Mechanisms of Evolution**

1. **Natural** **Selection** 2. **Genetic** **Drift** (Random chance of success or failure)

3. **Non-Random** **mating** (Choosing mates based on some preference)

4. **Migrations**/Gene Flow 5. **Mutations** (Changes in DNA)

**III. Modeling & Measuring Evolution**

a. Hardy-Weinberg (HW) Model Formulas: **1. p2 + 2pq + q2 = 1 & 2. p + q = 1**

b. Measures changes in 1. genotype frequencies & 2. allele frequencies

c. If no change occurs from 1 generation to the next, evolution did not happen. Only way this happens is if the 5 mechanisms above are not occurring.

**p2 = prop. of HD individuals 2pq = prop. of HET individuals q2 = prop. of HR individuals**

**p = prop. of dominant alleles q = prop. of recessive alleles**

**IV. Evidence for Evolution**

a. **Genetic Data** – Similarities & Differences in DNA/Proteins

b. **Biomolecule Data** – All life as we know it needs water and chemicals for energy

c. **Physical structures** – Similar **homologous** traits, embryology shows evolutionary similarities. Similar structures not due to homology are called **analogous structures** (wings of bird vs. insect)

d. **Fossil studies** & **Radiometric dating** show general age/timeframes

All of these can be used to construct **phylogenies**

\*Branched diagrams showing points of evolution, closer organisms share more features. Exact locations cannot be determined if data not provided, only analyzed based on relative closeness within the diagram.

**V. Conserved Features**

a. ALL ORGANISMS - **DNA/RNA Genetic Code**, Glycolysis

b. Photosynthesis in plants, some bacteria, algae

c. **Eukaryotes** – Organelles, Linear Chromosomes

d. **Endosymbiotic theory** reveals DNA and ribosomes in eukaryote organelles (chloroplasts and mitochondria) are more similar to prokaryotes than to their eukaryote “hosts”!!!!!! Infers that our organelles are the result of a symbiosis between many cells at some point in time.

**VI. Speciation & Extinction**

a. **Speciation** usually results from **reproductive isolation** (Sexually reproducing organisms)

At least 1 gene must change to affect a phenotype

b. **Pre-zygotic** Vs. **Post-zygotic** reproductive barriers

c. Also result from **geologic events & mutations**

d. **5 mass extinctions** – times of major geologic activity, species not adapted died out

**VII. Origins on Earth**

a. **4.6 BYA Earth forms, 3.5 BYA earliest fossils**

b. Inorganic molecules evolved into organic molecules to become building blocks for life

c. Low oxygen so first organisms probably anaerobic and chemosynthetic